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Jaundice in the Dog*

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The primary object of this paper is to emphasise the need for a more scientific investigation of a neglected veterinary problem. Much has been achieved on the human side at the expense of the dog, which has been subjected to countless experiments for the advantage of man with little benefit to its own species. Mortality in the dog is still very high and will remain so while literary and plagiaristic authorities are content to quote gall-stones and other etiological factors never seen in actual practice. No practical advance can be expected until the co-operation of pathologists and physico-chemists has been enlisted.

The term "jaundice" is inadequate, as a definition, because it embraces a train of symptoms involving many disease entities of the hepatic system, and as it has been said that the liver constitutes the greatest chemical factory of the body, it follows that any disorganisation of this member will bring into evidence complexities of chemistry, physiology and pathology.

The classification of jaundice types is controversial but for discussion one can broadly classify thus :—

1. Obstructive.
2. Haemolytic or non-obstructive.
3. Hepatic : (*a*) True poisons, *e.g.*, phosphorus.
   (*b*) Infections, *e.g.*, distemper.
4. Leptospiral—not under discussion.

In my original paper I outlined the chemistry and physiology of the subject, to date, with the idea of some sort of scientific approach. Owing to the printers' problem of space, however, I am compelled to delete this section and confine myself to a few salient factors.

Apart from the multiple functions of the liver, it must be remembered that bile itself not only excretes waste products from the disintegration of haemoglobin but also acts as a secretory agent in connection with synthetisation of salts and acids in the liver. Haemoglobin destruction produces the important end-product bilirubin, which is converted by intestinal bacteria into urobilinogen, and this, in turn, may be absorbed by the portal circulation into the liver to be finally excreted by the urine. In point of fact, the function of the liver can be calculated by the absence or excess of urobilinogen in the urine. Blount has summarised by saying that most disintegration products are formed in sites other than the liver, and although any portion of the reticulo-endothelial system can produce bilirubin, the most active factory appears to be the bone marrow.

The ability of the liver to excrete bile pigment is such that when one-tenth of the organ remains, after hepatectomy, the said pigment does not accumulate in the blood sufficiently to cause jaundice. Bile salts in the dog are mainly represented by the sodium salt of taurocholic acid which is formed in the liver only. Its decomposition products are partly absorbed by the intestine and again taken up by the liver, *via* the portal vein, where it functions as a bile-secreting stimulus—or natural cholagogue.

Apart from their assistance in the digestion and absorption of fats, bile salts are credited with various powers of activity including regulation of intestinal putrefaction and the elimination of certain toxins and metallic poisons. We do know, for certain, that by their addition the fat splitting action of the pancreatic juice is trebled.

Urea and uric acid present us with a more complicated problem which involves ammonium salts and amino-acids.

The Eck fistula experiment showed that the formation of urea from ammonium salts took place in the liver.

Mann and others proved by hepatectomy experiments that the production of urea is dependent on the liver and that removal of the liver resulted in accumulation of uric acid in the blood. This was substantiated by the experiments of Markowitz, who concluded that the most delicate test for failing liver function is the presence of uric acid in the blood.

The actual physiology of the gall bladder claims our attention at this juncture.

Bile is secreted by the liver at varying rates and the excess over need is stored in the gall bladder. The quantity received is much greater than the capacity of the bladder but this is adjusted by concentration. This ability to concentrate was demonstrated by Rous and McMaster, who collected the bile from (*a*) dogs whose bile had passed into the gall bladder, (*b*) dogs whose bile had gone direct. The proportion of pigment in the former specimen was ten times that of the latter.

Mann and Bollman showed, by ligature of the common bile duct, that the rapidity of development of jaundice is influenced by the absorptive function of the gall bladder. That is of interest in view of the fact that one is often puzzled by the sudden onset of biliary symptoms.

The regulation of flow of bile into the duodenum is a matter for some speculation. Some attach responsibility for the working of this mechanism to the sphincter of Oddi. Others favour a duodenal muscle tone and contractile power of the gall bladder backed up by the sympathetic nervous system and a bladder hormone. Copher and Kodama suggest the dilution and interchange of bile function in emptying the gall bladder by a sort of lavage process. That is to say, the entrance of bile from hepatic ducts into the gall bladder results in a washing out of its contents. Their conclusions were based on the fact that if the hepatic duct is ligatured while the cystic and common ducts are left intact, the gall bladder does not empty itself after a fat meal—as it should do in normal circumstances. This particular experiment was demonstrated and proved by persistence of the X-ray bladder shadow after the injection of tetra-iodo-phenolphthalein.

The distinction between obstructive and haemolytic jaundice is the outcome of research by such workers as van den Bergh and McNee, who claim to discriminate between the two types by means of the Ehrlich-diazo reaction. The frequent failure to discover any obstructive factor is borne out by the findings of Eppinger and Rolleston who decided that jaundice may be independent of the biliary apparatus and truly haemolytic in origin.

The theories of etiology had to be revised when it was realised that bile pigment, such as bilirubin, could be formed outside the liver—more particularly in the reticulo-endothelial cells of the spleen and bone marrow. Normally there is a precise balance between formation and excretion, so that only a small amount remains in the blood plasma. If red blood destruction is excessive the large amount of pigment rapidly exceeds the capacity of the liver to excrete—and bilirubin accumulates in the blood. The amount of accumulation can be estimated by the van den Bergh method.

Obstructive jaundice may be due to such causes as :—

1. Blocking of the ducts by inspissated mucus or viscid bile and occasionally by a congested plug of round worms.
2. Changes in the walls of ducts as in inflammatory catarrhal jaundice.
3. Extraneous pressure by new growths which are usually malignant.

It requires very little obstruction to produce jaundice, as the pressure of bile flow is weak. It has been possible to induce icterus in dogs by starvation and consequent diminution of bile flow.

There has been considerable argument in the past anent catarrh as a recognisable factor. Hutyra and Marek were emphatic in their view that this was a frequent cause and that the initial trouble was gastro-duodenal catarrh. Henry Gray was opposed to this opinion.

In view of the fact that in a few odd cases death is speedy and painful one might hazard the theory that catarrhal blockage of bile flow results in invasion of the pancreatic duct with the consequent pain of pancreatitis—and fatal termination in such cases.

Haemolytic jaundice is the term applied to any case in which the accumulation of bile pigments in the plasma is due to increased destruction of red blood cells and not to obstruction of the bile ducts or even to impaired excretion from parenchymal damage in the liver. Excessive amounts of bilirubin are liberated into the blood plasma.

The urine may contain no bile pigment but will register urobilinogen in abnormal amount—and this contrasts with its absence in obstructive jaundice. In this case bile salts are absent. The faeces are dark in colour owing to an excessive amount of urobilin—and this feature may be compared with the putty-coloured oily stools of obstructive jaundice. The intricate van den Bergh test, by its direct or indirect reaction, claims to differentiate between obstructive and haemolytic jaundice.

Some mention must be made here of the theory of dissociated jaundice which is the term applied to disparity between the retention and excretion of bile salts and bile pigments respectively. Brulé and his school contend that functional disorder of the liver cell is just as important as obstruction of the duct system. They claim that in diagnosis of icterus the final issue may be confused by the

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fact that, in certain cases, the salts and pigments become dissociated —the one being retained and the other excreted in the urine.

Symptoms.—These are so irregular and variable in their appearance and development that it is impossible to lay down any precise course of events. One can, however, differentiate between two opposed types of preliminary symptoms :—

(*a*) Inappetence, dullness and constipation.

(*b*) Vomiting, excessive thirst and diarrhoea.

So far, diagnosis is in abeyance, but within 24 hours the distinctive yellow discoloration may appear. The urine will be scanty and dark in colour while the faeces will be either clay coloured, foetid and oily, or dark and blood stained, according to type.

Rather than recapitulate all the classical symptoms known to us all I would prefer to record four actual cases, of diverse type, to illustrate the possible course of events :—

1. Terrier dog, eight years old.

First observed symptoms were complete loss of appetite, dullness and constipation. Temperature and pulse normal. Within 24 hours the membranes became faintly yellowish and in a week this dog died from nervous prostration and coma. Although there had been no vomiting during the illness there was violent haematemesis within an hour of death.

2. Labrador bitch, nine years old.

An acute case initiated by nausea, thirst, high temperature and collapse—all of which symptoms were maintained until death after nine days. The outstanding feature was complete suppression of urine. After two full doses of urea some relief was obtained but the resultant urine resembled dark treacle.

3. Scottie bitch, three years old.

This bitch had reared nine puppies up to five weeks, after which she became ill, off and on, but was not brought to hospital until moribund. *Post-mortem* examination revealed the following : All organs jaundiced. Fluid in abdomen and thorax. The intestine contained yellowish-brown mucus. Liver friable and putty coloured. Bile ducts completely blocked by mucus and no apparent flow of bile. Associated with pregnancy it is a moot point whether choline could have been of any value at the proper time.

4. Terrier dog, seven years old.

This dog suddenly became jaundiced in colouration only but otherwise appeared to be normal. Eventually he became capricious about feeding and lost weight over a period of five months. He would vomit mucus and bile occasionally and have intermittent bouts of thirst. There were varying periods of activity alternated with lassitude and heart depression. Beyond that he lived reasonably well, as a yellow dog, for six months.

In the end there was a sudden collapse and it was one of those few occasions when I have been able to register " Cheyne Stokes breathing " before coma supervened.

Treatment.—.This will depend upon the stage at which the patient is received, the nature of the symptoms and whether it is possible to diagnose the type of jaundice. The deduction that a yellow dog is suffering from jaundice is of little avail—because the system is already saturated and, in most cases, it is too late to de-saturate. We have not the advantage of our medical confrères who can study the premonitory symptoms of latent jaundice. The numerous and, for the most part, ineffective medicinal agents prescribed in the past have been used, no doubt, on the assumption that jaundice is mainly obstructive. Even to-day one has to admit that much of our so-called modern treatment is, on occasion, more or less empirical.

The oral administration of drugs to a vomiting patient will only hasten the end. For the non-vomiting subject, a preliminary emetic may be useful in clearing the stomach of mucus and foreign matter, but its primary and theoretical object of evacuating the gall bladder is seldom, if ever, achieved. When indicated, the preference lies with apomorphine subcutaneously or washing soda *per os*. Both are speedy and harmless in action. In the event of constipation, a cathartic is indicated and calomel, in calculated dosage and in the form of a keratin coated pill, should be given and followed by a suitable saline, such as artificial Carlsbad. The latter not only stimulates peristalsis but also assists in the elimination of mucus from the intestine.

As regards general medicinal treatment I shall only suggest sodium bicarbonate to full tolerance and ammonium chloride in cautious doses.

Orthodox therapy calls for a cholagogue but the majority of chemical agents classified as such appear to have little or no value. The only effective cholagogue is the natural bile salt—sodium taurocholate. Then again, if a diuretic is indicated, urea will give best results.

The vomiting patient presents the most difficult problem, but it is sometimes possible to control the sickness by minute doses of hydrocyanic acid. Chloretone has a similar effect but with the disadvantage of general doping. The discretionary use of either or both of these may make it possible to feed a little glucose by the mouth. Normal saline infusion, in large quantity, constitutes without question the most useful agent in the elimination of effete matter and as a general stimulant. Further stimulation may call for the subcutaneous injections of coramine or whatever appears to be necessary, accompanied by warmth even to the point of actual heat applied to the liver region by whatever means is available.

In phosphorus poisoning the jaundiced condition is usually late in appearance but when there is definite knowledge of recent swallowing of rat-bait, the immediate antidolal treatment takes the form of potassium permanganate or copper sulphate in weak solution by stomach lavage. The jaundice of distemper, or of any other secondary invader, calls for no special comment as treatment will follow general principles.

Diet.—Diet presents a serious difficulty as most subjects are dependent for life, over a period, upon the injection of normal saline and intravenous glucose. Less acutely affected patients may be able to tolerate skimmed milk or milk diluted with flat soda water, glucose and concentrated meat essences. Finally, both the convalescent and the chronic subject may be allowed raw lean scraped meat and almost any other suitable food with the exclusion of all fat.

I venture to say, in conclusion, that until the various liver diseases and degenerations have been studied in their proper focus and relationship we shall not solve the problem of why jaundice is so fatal in the dog whereas it can be controlled in the human subject.

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Discussion

The discussion was opened by Dr. E. G. White, of the Royal Veterinary College, as follows : In the first place may I say how pleased I was to be invited to open this discussion on Mr. Stainton's paper. He has shown clearly how little is known about the cause of jaundice in the dog, and this in spite of the fact that knowledge of jaundice in man is based largely on experimental work carried out on dogs. One reason for failure to apply experimental findings to the study of natural jaundice in the dog is that many of the tests used to distinguish the different types of jaundice in man, and in particular the various tests for liver function, can only be carried out in close association with the laboratory and require a series of chemical estimations over a period of time during which 24-hour urine samples must be obtained, blood samples examined, etc. Such procedures are obviously almost impossible to carry out under conditions of veterinary practice. There is no doubt, however, that we are only likely to improve our knowledge of jaundice if every advantage is taken of the facilities which the biochemist and pathologist have to offer, with especial reference to examination of blood, urine and faeces and the carrying out of a detailed *post-mortem* examination on animals which die or are destroyed.

Gallstones.—I have no record of gallstones in the dog, but there are records in the literature of their occurrence. They consist mainly of bile pigment, bile salts and calcium and their cholesterol content is low. In man, on the other hand, gallstones often contain a high proportion of this substance ; some, indeed, consist almost entirely of it. This difference is related to the much lower cholesterol content of dog bile as compared with human bile. Human gallstones containing 77 per cent. cholesterol placed in a dog's gall bladder were completely dissolved within 6 to 17 months.

Incidence of Jaundice.—In a series of 1,494 dogs examined *post mortem* there were 27 cases of jaundice, *i.e.*, 1·5 per cent. In eleven animals the cause was considered to be liver disease (cirrhosis, 3 ; toxic necrosis, 8). In four dogs the cause was obstruction of the bile ducts, three being due to adenocarcinoma of the pancreas and one to sarcoma of the duodenum. It was not possible from our records to determine the cause of the jaundice in the remaining 12 cases. Perhaps Mr. Stainton could give some idea of the incidence of jaundice in his practice.

Tests for Bile Salts and Bile Pigments.—The sulphur test for bile salts is merely a test for reduced surface tension and one should use a control tube of normal dog urine. There is no chemical test for bile salts which approaches in sensitivity the van den Bergh test for bilirubin.

The tests for bile pigments in urine employed by the practitioner are not extremely sensitive but are probably sufficiently so for clinical work. The van den Bergh test, as used for blood, can be applied to urine, after concentrating the bilirubin by addition of barium chloride and filtering. Human blood normally contains 0·2 to 0·8 mg. of bilirubin per 100 c.c. whereas there is no appreciable amount in the blood of the dog. Thus, in using the van den Bergh test, the tests for urobilin in urine or for stercobilin (urobilin) in faeces one would first need to acquire some experience in the interpretation of the findings since their normal values differ considerably from those in the human subject.

Catarrhal Jaundice.—It is now generally accepted that many cases of so-called catarrhal jaundice in man, formerly considered to be due to duodenal catarrh, secondarily affecting the bile ducts and resulting in their obstruction, are in fact caused by hepatitis. A proportion of cases of human catarrhal jaundice are thus toxic or infective in nature. Outbreaks of epidemic catarrhal jaundice in man are considered by some to be probably due to a filterable virus. In my opinion jaundice in the dog due to catarrhal obstruction of the bile ducts is very rare.

Toxicity of Bile.—It is now generally agreed that bile pigments and cholesterol are relatively harmless and the only constituents of bile which are considered toxic

are the bile salts. They may be responsible for the mental depression and pruritus seen in obstructive jaundice in man. In this connection it is of interest to know whether pruritus is a frequent accompaniment of jaundice in the dog. It is thus the underlying causes of jaundice which should be diagnosed and treated whenever possible.

Major H. KIRK congratulated Mr. Stainton on his pluck in bringing forward so complicated and difficult a subject. He still had to adhere, however, to his previously expressed opinion that mortality in jaundice was about 95 per cent., though if attacks of leptospiral jaundice could be taken in time the death rate might be reduced to 45 per cent. by the use of specific serum. He had made many *post-mortem* examinations of cases of jaundice over a number of years, but had never found gallstones; Woodruffe Hill and others, however, stated that they had done so, though Schnelle, of Boston, who attended in his clinic 40,000 dogs a year, said that he had never seen one.

Mr. Stainton had given the four types of jaundice met with as obstructive, haemolytic, hepatic and leptospiral—a classification which, however, omitted malignant jaundice (canine Babesiasis) and also the toxaemic type due to poisoning by various toxins. The essayist stated that despite numerous *post-mortem* examinations, he had never discovered anything to account for the condition: that was a difficulty common to all clinicians, but he (the speaker) had found obstructive jaundice to be the rarest type. If this type were common they would confirm its presence more often after death. He was coming round to the opinion that the majority of cases, and particularly in greyhounds, were due to the Spirochaete *icterohaemorrhagiae*, or to the cause of typhus, the Spirochaete *canicola*, and he would ask Mr. Stainton if he considered that a serum made from the latter organism would be of value. He had never heard of a hormone associated with the gall bladder: what did it do?

In distinguishing between the obstructive and the haemolytic types, the essayist gave them some very exhaustive and delicate tests. Clinically, the important differential test was that in obstructive jaundice the faeces were white or clay-coloured, with free fatty acids and neutral fats in great abundance, whereas in the haemolytic type the faeces were dark and tarry and the fatty excretion normal. He thought that Mr. Stainton had said that the yellow colouration in jaundice appeared in 24 hours, but his own experience was that it was not evidenced for four or five days. That was why anti-leptospira serum was almost valueless to the clinician: they were told by the makers of that serum that it must be injected within four days of the onset of infection, but within those four days the symptoms were so vague as to make a true diagnosis impossible. It might be specific if they could give it the first day after infection and before icterus appears.

Mr. Stainton had not mentioned endeavouring to ascertain whether a primary hepatitis was concerned. From the clinician's point of view, it might be purely a hepatitis and nothing else, so he pinned his faith on finding indican in the urine and urobilin in excess. He believed it was true that these features were diagnostic of hepatitis.

In regard to treatment, his view was that eliminatives and diuretics were of great value, clearing the body of all effete matter. He used copious amounts of normal saline by all available routes and washed out the stomach with a solution of bicarbonate of soda, followed by administration of three grains of "anaesthesin" to allay vomiting. A method that Hutyra and Marek recommended was the injection of pilocarpine because, so they said, it caused relaxation of the sphincter of the ductus choledochus. Concerning diet, the essayist's advice was to give the dog raw, lean meat, but he (the speaker) advised them to go cautiously in this respect because they might be dealing with a case of typhus, or an albuminuria involving nephritis.

Dr. Orr had said that out of 27 cases he had found liver disease in eleven and obstruction in four, while three had pancreatic carcinoma. He had also enquired as to the numerical incidence of cases in general practice. On an average, in his private practice, he (Major Kirk) met with about four cases in a year, but in his greyhound practice he got scores and he thought the reason for that difference was the presence of rats in large established kennels; where there were rats there was generally leptospiral jaundice.

Mr. DUNLOP MARTIN: He must confess that he had often wondered how many cases of jaundice had some more or less definite association with infection from rats, because in most of these cases he had, for some years now, on diagnosing the condition, given at least one dose of anti-leptospira serum and with, he thought, very favourable results. He heartily supported Mr. Stainton's idea of giving plenty of saline subcutaneously, with a small amount of glucose. One other thing he found useful was the administration of a small dose of calomel (one-fifth grain) with a grain of sodium bicarbonate.

Miss S. STAINTON: One of the cases reported in the paper was hers, but apart from that she had had two other cases which, to her at all events, were quite interesting. One was in a seven-months-old bitch and it occurred during a brief absence from hospital. She was informed by telephone that this bitch had developed jaundice in her kennels where it was being boarded, and had collapsed, though when she left it had seemed perfectly well. She gave instructions that it was to have calomel, quarter grain, in the morning and Epsom salts in due course. Two days later, when she got back, she found that these instructions had been carried out, but that the dog had eaten nothing. They gave it another dose of calomel and normal saline, but there was no improvement. She had been prepared to supply her father with the necessary specimen (laughter), but when she went to see it, the dog was more or less all right. Dosing for worms had been negative, and it was now—at the time of speaking—normal.

The other case was a cat, which was still jaundiced although it came to her about two months previously with very marked "yellows." It had been treated with calomel and was then quite normal, but continued to look very yellow. She did not know if that was usual.

Major LESLIE PUGH: Mr. Stainton had rather eliminated leptospiral jaundice from the discussion, but he thought their experience in the country was that the great majority of cases of jaundice were leptospiral in origin. Having had a fairly large experience of these cases and the fatalities which followed, he would like to suggest one thing, namely, calomel should not be given, because the majority of cases of leptospiral jaundice seemed to die from intussusception of the small intestine. The percentage of recoveries increased when they gave sodium bicarbonate and avoided all purgatives. He relied on this, with one-third milk and two-thirds water with glucose, to secure a definite clearing of the jaundiced appearance.

In reference to the cases, reported by Mr. White, which were not diagnosed and in which the urine was injected into guinea-pigs and they did not find leptospira, his experience was that it must be done at once if one was to find the leptospira in the guinea-pigs. All observers admitted that it was extremely tricky to pick up the leptospira whether by dark ground illumination or by guinea-pig inoculation.

He thought that treatment by anti-leptospira serum, if applied before jaundice appeared, was of value, whereas once jaundice was manifest it was useless. In the country, if they got a case of jaundice in a kennel and there were any youngsters there, they immediately immunised the others with hyperimmune serum.

With regard to gallstones, he had sent to him by a doctor, who said his dog had died of jaundice, gallstones the size of a pea. He (Major Pugh) thought that in some cases of chronic jaundice one would find gallstones.

Major KIRK asked Major Pugh if he deprecated the use of calomel, would it be a good procedure to give Glauber, Carlsbad or Epsom salts instead, in leptospiral jaundice?

Major PUGH replied that he did not think that anyone could diagnose leptospiral jaundice until the jaundice appeared, because all one had to go on was the high temperature. They slipped in a dose of serum, but even then he did not give a dose of calomel: he did not like to purge them, even at that early stage.

Major G. E. OXSPRING: He happened to have considerable experience of malignant jaundice in dogs—to which reference had been made by Major Kirk—and in many parts of the world, particularly in Hong Kong, and he thought he could state that something between 40 and 50 per cent. of these canine cases were what they called tick fever or malignant jaundice. Trypan blue injection was the mode of treatment most favoured in his day, but he could not say that he had had success with anything he tried. In his experience in this country, the few cases he had had recover from jaundice he had treated with normal saline and small doses of calomel, despite the fact that one might get a few cases of intussusception of the small intestine.

Mr. GILLARD, before he left the meeting, had asked him to mention on his behalf, on the question of calculi of the gall bladder, that in all his experience he had actually seen only one case, and in that instance three or four calculi were present.

Major KIRK said that he wished to inform the last speaker that there was a specific for canine jaundice, namely, acaprin.

Dr. T. HARE: Were they not likely to become benumbed by a symptom? He was sure Mr. Stainton—to whom he tendered his gratitude—did not fix his mind solely on the symptom of jaundice, ignoring the temperature, the tonsils, the glands of the neck, the corneal-scleral junction, and other elements of systematic examination. For instance, jaundice was frequent in the bacteraemic stage of *Beta haemolytic streptococcus* infection; but, as they recalled from the classic work of Laidlaw and Dunkin, in the pathology of the uncomplicated infection by the virus of distemper, there was no jaundice.

Leptospiral jaundice of dogs, in his experience, was rare in this country. It occurred as epidemics and consequently claimed a disproportionate degree of attention. From the discussion it would appear that a large amount of anti-leptospiral serum was used empirically. He would suggest that they should cease to use jaundice as a specific entity: it was merely a symptom of infectious and chemical agents or of factors producing obstruction to the outflow of bile.

The PRESIDENT (Mr. H. Scott Dunn): He had seen a considerable number of cases of jaundice and was particularly interested in the discussion. Having rats in his Stadium kennels and his own, he believed that most of his cases were leptospiral in origin. Success was not achieved with the serum if given late, but if given early he did know it had good results. He had inoculated a large number of dogs with vaccine and they had never had jaundice, but possibly they would not have had it in any case.

Major Pugh did not like calomel. It was a matter of opinion: he, personally, thought he had seen some good results from calomel, though he was not particularly satisfied about it. With regard to the question of intussusception, his belief was that if a dog died of intussusception, the intussusception was there before the jaundice.

A MEMBER stated that Dr. STEWART, of the Glasgow Royal Infirmary, had found that 50 per cent. of the dogs he examined showed positive agglutination to leptospira.

THE REPLIES

Mr. STAINTON: Dr. White had raised the question of pruritus. He knew it to be a common symptom in the pathology of human jaundice, but they did not get very marked pruritus in dogs. The incidence of jaundice must be very low, because a good many thousand dogs went through his own practice and the practices of other people he knew and the number of cases was very small in proportion.

Major Kirk had made reference to the gallstone hormone. That was a theory: he did not think it was established beyond doubt that there was a definite hormone. The President and others had raised a more common question: calomel or no calomel? They all had faith in what they found worked in practice. Obviously calomel was not advisable in leptospiral jaundice, but in ordinary jaundice he would say it had its uses, but he was interested in what the President went on to say about intussusception. He quite agreed with him that the intussusception occurred first and then the jaundice; you sometimes found that as a complication of distemper in young puppies.

As regards the types—obstructive and haemolytic—referred to by Major Kirk, they knew the difference clinically by comparing the character of the faeces; so far as their chemical nature was concerned, that was where the van den Bergh test came in.

Concerning the points raised by the rest of the speakers, he made it quite clear at the beginning of his paper that leptospiral jaundice was not under consideration. Jaundice was not always leptospiral in origin, but many of them had had experience of leptospiral jaundice and it had been very interesting to hear what they had to say: it had been most instructive and helpful to have it brought in, but his paper was just a glossing over of the subject as a preliminary, to see if they should not go into these more detailed aspects perhaps later on. He would like to assure Dr. Hare that they tried to make if fairly adequate examination of their patients, but they could not, nevertheless, always diagnose jaundice or a *Beta haemolytic streptococcus* infection where a dog had got a temperature or a swollen gland. The whole point of his paper had been that the clinician, up to now, had more or less failed in regard to jaundice and they were crying out to the pathologist for help.

Dr. WHITE: It was very interesting to hear reference to *Piroplasma canis* infection abroad. That was one of the natural examples they had in the dog of a haemolytic type of jaundice and one would imagine that it was an example where one got less severe pigmentation than one did in obstructive jaundice.

Confirming what Mr. Stainton had already said in reply to Major Kirk's question about the existence of a gall bladder hormone, he would mention that the existence of such a hormone was claimed by Ivy in 1932 and the hormone was called by him "cholecystokinin." It was supposed to be absorbed into the blood stream during digestion and to cause contraction of the gall bladder.

In regard to the obstructive jaundice in man, Samson Wright stressed the fact that the patient must not be given any meat or meat extract, and yet lean meat was one of the things that one recommended in the diet of jaundiced dogs.

The van den Bergh test was considered now not to be so reliable in determining the type of jaundice present.

THE LIVESTOCK PROBLEM

Devon is not altogether in agreement with all the suggestions put forward by the Ministry in its latest livestock programme. This county has a multiplicity of breeds which embarrasses the Committee. The suggestion evidently is that in the north there should be a return to the traditional policy of rearing beef, but among the small farmers the milk cheque is an attraction which they will not readily renounce. There is a danger that the bigger men—the economic milk producers—may be glad to take the opportunity of getting away from the seven-day-a-week drudgery of dairying. The solution to the Ministry's problem seems to be for Lord Woolton to make beef more attractive on its own account,—*Farmer and Stock-Breeder*.

CLINICAL COMMUNICATION

Mustard Gas Poisoning in the Horse

JOHN F. WATSON, M.R.C.V.S.
MILNATHORT

Subject.—Welsh pony, aged 6 years.

History.—This pony was owned by the military authorities, and had been grazing for several weeks past in a field adjoining the camp. The animal was noticed to be very dull one evening, and on the following morning considerable salivation and distress was apparent. There was complete loss of appetite.

Clinical Symptoms.—The initial picture was one of extreme nausea—ears drooping and head down. There was profuse salivation from the mouth and every few minutes the pony dipped its nose into a nearby trough of water.

The temperature was 99·7°; the pulse rate 89 and rather weak. There was obviously pain in the mouth region which was causing the animal to smack his lips. The excess of saliva was causing fits of coughing accompanied by slight dyspnoea.

An examination of the mouth revealed large wrinkled areas of dead skin involving the inside of both lips, cheeks and tongue. The latter organ was swollen and very painful to the touch. Numerous large ulcerous sores were apparent on the mucous membrane, while the breath had a slight smell suggestive of onions.

The eyes appeared quite normal, and no other visible lesions were present.

Diagnosis.—This subject had obviously been in contact with a corrosive irritant poison. It was learned from the adjutant that recent military exercises had entailed the use of Yperite (mustard gas). The pony was grazing in close proximity to the infected compound.

Prognosis.—The contamination appeared to be moderately slight and damage to the regions of the mouth seemed superficial. There were no real deep-seated ulcers present. However, under the circumstances, a guarded prognosis was given.

Treatment.—The entire mouth region was, as far as possible, freely flushed with a solution of bicarbonate of soda (1 dessertspoonful to a pint of water). The eyes and nostrils were sponged with a solution of boracic acid. The mouth was thereafter swabbed out three times daily with a solution of 1:1,000 acriflavine. As a precautionary measure, the feet and legs were thoroughly washed with soft soap, warm water and soda carbonate. The water in the drinking trough was replaced by a solution of bicarbonate of soda.

The diet to consist of soft food, such as bran, boiled grain and carrots.

A dose of ammonium carbonate was administered by the stomach tube.

Sequelae.—Large necrotic areas were shed from the mucous membrane of the mouth, but this was soon followed by a healthy granulating wound. The animal commenced to feed after two days and subsequently thrived very well.

PENICILLIN

Veterinary Medicine reports that thus far (July, 1943) the results of investigations made by the Committee on Medical Research of the Office of Scientific Research and Development, U.S.A., and other associated bodies, have completely upheld the early promise contained in the reports on the bacteriostatic agent penicillin by Florey, Chain and their collaborators at Oxford. "There is good reason for the belief that it is far superior to any of the sulphonamides in the treatment of *staphylococcus aureus* infections with and without bacteraemia, including acute and chronic osteomyelitis, cellulitis, carbuncles of the lip and face, pneumonia and empyaemia, infected wounds and burns. It is also extremely effective in the treatment of haemolytic streptococcus, pneumococcus and gonococcus infections which are resistant to sulphonamides. It has not been found effective in the treatment of subacute bacterial endocarditis. Studies of the results of its local application are still inadequate."

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WEEKLY WISDOM

He who has not even a knowledge of common things is a brute among men. He who has an accurate knowledge of human concerns alone, is a man among brutes. But he who knows all that can be known by intellectual energy, is a god among men.—Anon.

* * * * *

That beef blood serum may supply globulin and thus be a possible aid in preventing the often fatal drop in blood pressure which follows severe shock or haemorrhage, was announced recently by Dr. Eric Ogden, of the University of California.

ABSTRACTS

[ACETONAEMIA IN DAIRY COWS. DURRELL, W. B. (1943.) *Canad. J. comp. Med.* **7**. 54-57.]

Durrell suggests a clinical division into three types of cases, *viz.*, (*a*) the "paralytic or milk fever type," accounting for about 10 per cent. of all cases and manifested immediately after parturition; (*b*) the "digestive type," constituting 80 per cent. of all cases and manifested from 10 to 40 or more days after calving; (*c*) the "nervous type," which may appear at any time and may or may not be associated with one of the other types.

The treatment of eleven cases occurring during the month of November is epitomised. One was of type (a), and responded within three days to intravenous dosage with glucose and calcium gluconate, although it reappeared within 28 days as type (*b*) and then responded only to chloral hydrate after glucose therapy had proved ineffective. Nine were of type (*b*), and in two of them which proved stubborn, insulin therapy appeared beneficial. One was of type (*c*), but it recovered also.

An editorial comment suggests that vitamin B_1 may be of value in the treatment of ketosis in bovines.

A. N. W.

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[URINARY CALCULI IN SHEEP. BEESON, W. M., PENCE, J. W., and HOLM, G. C. (1943.) *Amer. J. vet. Res.* **4**. 120.]

Small numbers of wethers were fed on rations designed to produce the conditions reported by various authors as leading to calculus formation. Some of these animals received diets low in vitamin A content, others rations high in vitamin A content, with the addition of high proportions of cottonseed or linseed meal, wheat bran, calcium, magnesium, or calcium and phosphorus; others received additional sulphur or silica. Only one animal of 48 under test showed calculus formation; this was a wether that had received a high vitamin A, high wheat bran, diet. It appeared that neither vitamin A deficiency, nor mineral imbalance even of a degree unlikely to be met with under field conditions, was of aetiological importance in calculus formation. The possible role of infection was suggested by the observation that urine samples on standing would often deposit crystals of magnesium ammonium phosphate, due to ammonia production by urea-splitting bacteria.

Four calculi were found in sheep not under experiment; these were formed in the collecting tubules of the kidneys, and were composed mainly of silica.

E. C.

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[THE DISINFECTION OF BABY CHICK SHIPPING BOXES WITH SODIUM SILICATE SOLUTIONS. MCCULLOCH, E. H., FULLER, S. A., and ROGER, L. M. (1943.) *Amer. J. vet. Res.* **4**. 95.]

In tests to find the best means of repeated disinfection of cardboard chick boxes for despatch of chicks from hatcheries commercial water glass (Na_2O—8·9 to 14·5 per cent. and SiO_2—28·3 to 29 per cent.) gave promising results. The authors tested this and several sodium silicate solutions of which the sodium oxide : silica ratios varied between 1 : 2·0 and 1 : 3·2.

They were found to be effective against most of the common poultry pathogens exclusive of *Mycobacterium tuberculosis* if diluted with an equal amount of water and used after first scraping the boxes of faecal content. The solutions were painted on and found to give additional strength to the cardboard. The most alkaline solutions gave the best germicidal results. If greatly diluted they were not sufficiently buffered to maintain the hydroxyl ion concentration necessary to destroy Gram-negative bacteria in the presence of faeces.

All solutions tested were found non-injurious to chicks despatched in the treated boxes.

C. V. W.

EUROPE'S DAIRY HERDS

Britain's pedigree bulls, it is expected, will be utilised considerably in the task of rehabilitating the dairy herds of Europe when peace comes. Preliminary investigations—necessarily tentative at this stage—indicate that at least 500 will be wanted for export when fighting in Europe ceases. Licensed bulls, pedigree and non-pedigree, in Great Britain in 1939, totalled 114,000. The Continent's main demand in the early stages will probably be for dual-purpose cattle which will yield milk and also be employable on draught work in the fields. The Devon type is likely to be particularly popular for this breeding. At the same time the United States, the Dominions and the Argentine may be asked to supply up to 1,000,000 "utility" cattle in the first two post-war years.—*Daily Telegraph.*

Some Notes on Modern Methods of Treatment and Control of Bovine Mastitis and Contagious Abortion

L. E. W. BEVAN, M.R.C.V.S.

As it would appear that the remedies prescribed by the Survey Committee for the prevention and treatment of mastitis and contagious abortion have not met with universal approval and success, some notes based upon past experience of similar drugs and vaccines may not be inopportune.

SULPHONAMIDES. In *The Journal of Comparative Pathology and Therapeutics*, Vol. L, No. 4, 1937, the writer recorded a case of abortus fever in a little girl, six years of age, and mentioned that in the absence of any known specific remedy, *proseptacine* was employed in minute doses. At the time the article was contributed the child appeared to have recovered but she subsequently relapsed and nearly succumbed. In despair a massive dose of *sulphonamide P* was administered and thereafter she made a complete recovery. As the result of seven months' most careful observation it became evident that sub-curative doses, while temporarily alleviating the symptoms, failed to effect a cure but converted an acute into a sub-acute or chronic form of infection; and that only by the administration of maximum dose consistent with safety, at the height of an acute reaction, could cure, in the sense of sterilisation, be brought about. This view has been confirmed by others and is in accordance with the writer's experience in the treatment of trypanosomiasis with Bayer 205. It is suggested that this principle applies also in the treatment of bovine mastitis, and that the dilution and alteration of the drug in the rumen and other parts of the intestinal tract, renders the necessary concentration difficult to attain.

VACCINE *plus* CHEMOTHERAPY. The treatment of mastitis by vaccines or toxoids is helpful, but they must be specifically related to the pathogenic organisms. When such vaccines are available they may be applied prophylactically and enhance the effects of subsequent doses of sulphonamide. They appear, as it were, to "introduce" the drug to the specific organism and render it more vulnerable. Some general practitioners who have employed this method speak enthusiastically of it.

ACRIFLAVINE is recommended as an irrigant of the udder. In or about the year 1913 the late Professor Ehrlich sent to the writer in Rhodesia a supply of trypaflavine, the precursor of acriflavine, for the experimental treatment of trypanosomiasis. In appropriate doses it destroyed trypanosomes both *in vivo* and *in vitro*. Trypanosomes are, of course, unicellular protozoa and the question arises whether other highly sensitive protoplasmic cells, as for example, those of the mammary gland, may not be equally vulnerable. General practitioners and their clients have complained that acriflavine injections have caused permanently "hard udder."

"LIVE VACCINES." Inoculation with "live vaccines," *i.e.*, vaccines composed of living pathogenic organisms, as recommended by M'Fadyean and Stockman themselves, appears to have produced good results when properly applied, but is now regarded as too dangerous for general use, although commercial firms continue to issue them indiscriminately. There are some who have admitted that they have applied them to pregnant animals without untoward results. The explanation may lie in the fact that the *Br. abortus* is very sensitive and easily attenuated by sub-cultivation or suspension in various liquids. Thus Schroeder, in 1922, having tested twenty-four commercial "live vaccines" then on the market, wrote: "The real fact of the matter is that only five of the suspensions were found to be perfect with all four tests, and that means that nineteen, or 79·18 per cent., of the twenty-four, ranged in value from doubtful to positively worse than worthless." Also in the same paper he stated: "Suspensions of abortion bacilli in normal salt solution, kept at room temperature, occasionally show a greatly reduced virulence for guinea-pigs in 24 hours, and failed to cause lesions after 48, 72, and 144 hours." It may be, therefore, that some of the so-called "live vaccines" issued in this country were not "live" in the sense that they were virulent or pathogenic, but were actually attenuated or little better than the much maligned "dead vaccines." The good results attributed to them may have been due to this fact.

The writer, when Director of Veterinary Research in Southern Rhodesia, found it undesirable to issue "live," that is, pathogenic vaccines, because of the danger of disseminating and perpetuating infection under ranch conditions, but during a period of ten years issued officially over half a million doses of a so-called "devitalised" vaccine prepared by submitting virulent cultures to the action of chloroform—a process which was adopted on the grounds that chloroform conserved all the integral properties of the organism, which were considered essential in the preparation of a good antigenic vaccine. The results appeared to him and the majority of those who used it, to be highly satisfactory, although it is only fair to say that there were some who attributed the cessation of abortions which generally followed the application of the vaccine to the "natural wearing-out process" whereby herd immunity follows herd infection. The "de-vitalised" vaccine could be applied with safety to pregnant and non-pregnant animals alike—a very desirable feature under ranch conditions—and caused a well-marked agglutination reaction. The results were, admittedly, "uneven" and appeared to be better in herds where infection was most severe and widespread. Rightly or wrongly, this was explained on the assumption that the vaccine gave rise to a transient or passive immunity which was reinforced and converted into a more lasting or active immunity by superimposed natural infection. It is in order to draw attention to this possibility that this chapter of very ancient history is now referred to.

In the past, "dead" and "attenuated" vaccines have been somewhat carelessly condemned. This may not have been entirely justified. It may be that some of them served a useful purpose by setting up a temporary immunity which could be enhanced by subsequent virulent infection. This principle, which was first employed by Pasteur himself in his inoculation processes against quarter-evil and anthrax and is well known to every laboratory worker engaged in the production of hyper-immune sera, seems to have been overlooked as a means of conveying protection against abortion disease. In view of our failure in the past to control this insidious and costly disease, further research in this direction might prove worth while.

REFERENCES

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NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Sept. 15th.—Meeting of the Western Counties Division, N.V.M.A., at Exeter, 2 p.m.
Sept. 16th.—Annual Meeting of the Society of Veterinary Practitioners at Nottingham, 2.15 p.m.
Sept. 16th.—Summer Meeting of the Eastern Counties Division, N.V.M.A., at Ipswich, 2 p.m.
Sept. 17th.—Meeting of the Welsh Branch, N.V.M.A., at Shrewsbury, 2 p.m.
Sept. 27th.—R.C.V.S. Committee and Council Meetings, 16, Bedford Square, W.C.1.
Sept. 28th.—Meeting of Council, N.V.M.A., Connaught Rooms, Great Queen Street, Kingsway, W.C.2.
Sept. 28th.—Special Meeting of the Society of Women Veterinary Surgeons, in London.
Sept. 28th.—Meeting of the Veterinary Inspectors' Association, at the London School of Hygiene and Tropical Medicine.
Sept. 29th and 30th.—**N.V.M.A. Annual Meeting and Conference, London School of Hygiene and Tropical Medicine.**

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N.V.M.A. Luncheon

The Association already is assured of a number of eminent guests for the luncheon to be held on Wednesday, September 29th, on the occasion of the N.V.M.A. Annual Meeting and Conference. The ticket price of 10s. 6d. mentioned in our last issue refers exclusively to the luncheon, and it is hoped that intending participants will make early application to the General Secretary, enclosing remittance.

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PERSONAL

Birth.—At 23, Queen Street, Castle Douglas, on August 22nd, 1943, to Josephine, wife of Geo. D. Leslie, M.R.C.V.S.—a daughter.

Marriages.—OWEN—LEWIS.—At Hermon C.M. Chapel, Llandrillo, Merioneth, by Rev. J. W. Williams, B.A., David Wynne Owen, M.R.C.V.S., eldest son of Mr. and Mrs. W. Owen, Pen-y-Bryn, Criccieth, to Mair Gwenerys Lewis, B.A., only daughter of Mr. W. G. Lewis and the late Mrs. Lewis, "Hafan," Sennybridge, Brecon.

ROBERTSON—SINGLETON.—At the Holy Trinity Church, Bangalore, India, on December 15th, 1942, Lieut. A. I. Robertson, R.A.V.C., and Marjorie Elaine Singleton, Sister Q.A.I.M.N.S.R., only daughter of the late Mr. and of Mrs. W. Singleton, The Nilgiris, S. India.

R.C.V.S. OBITUARY

Dunwoody, Robert, Senior Veterinary Officer, Veterinary Department, Vom, Bukuru, N. Nigeria. Graduated Edinburgh, December 16th, 1922. Died (lost at sea) July, 1943.

Mr. Robert Dunwoody, M.R.C.V.S.

A Tribute

Your readers will have learned with regret that Mr. Robert Dunwoody has been lost at sea through enemy action, whilst returning to duty from this country.

Mr. Dunwoody joined the Colonial Veterinary Service in 1923 as a Veterinary Officer in Uganda and transferred to Nigeria in 1926. He was still serving in that Colony where he was promoted to the rank of Senior Veterinary Officer in 1938. He has acted as Deputy Director of the Department.

It was my privilege, a little while before he sailed, to talk with him of his work in Nigeria. His health had necessitated medical treatment, but, quite recovered, he spoke with enthusiasm of all which his department had undertaken and the further work it had in view. Like other colonies, Nigeria had to face many problems on the outbreak of war; the energy with which they were met has resulted in a valuable contribution to the war effort. By no means the least in that effort were the staff of the Veterinary Department, who were called upon to initiate, organise and guide the production of additional foodstuffs both for local consumption and for use elsewhere. As a Senior Officer, Mr. Dunwoody was responsible for this work over a large area and was returning when he met his death.

His loss will be a severe blow to his colleagues and the territory. At no time is it easy to spare men of experience and enthusiasm; under present conditions the loss is even greater. Having given of his best to the colony in which he served, he has been called upon to join those who have given all. J. S.

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Roll of Honour

Prisoner of War.—We regret to note from the Army Council casualty list published on August 27th, that Major Vere Arscott Bartrum, O.B.E., of the Royal Army Veterinary Corps, is a Prisoner of War.

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ROYAL ARMY VETERINARY CORPS

The following announcement is made in the issue of *The London Gazette* dated August 20th, 1943: To be Lts.: Brain Smith Hanson (282535), July 15th, 1943; Joseph Forde Gracey (282681), July 16th, 1943; George Barlow Parker (282745), July 19th, 1943.

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UNIVERSITY OF LONDON EXAMINATIONS IN VETERINARY SCIENCE

The following candidates, all of the Royal Veterinary College, have passed, as internal students, the second examination in veterinary science of the University of London (July, 1943): Comben, Norman; Daykin. Philip William; Gibson, Edward Arthur; Ingram, Percival Leslie; Murray, Chalmers Bruce; Rollinson, Denys Hugh Leonard.

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The retirement from the Bureau of Animal Industry, U.S.A., is announced of Dr. Adolph Eichhorn, who, except for a peridd as director of the Veterinary Department of the Lederle Laboratories, has served continuously in the B.A.I. since 1901. His last assignment, which he has held for five years, was that of director of the Animal Disease Research Station at Beltsville, Maryland. In 1941 Dr. Eichhorn was the recipient of the Twelfth International Veterinary Prize, the highest award open to American veterinarians.

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A resolution of alarm at the reduction in the number of sheep in the country, and stating that it was essential that there should be a substantial increase for the maintenance of fertility of the soil, was passed by the Smithfield Club in London.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal views of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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POST-WAR PLANNING

Sir,—I wish to endorse the remarks of Dr. Edwards *re* the responsibility of this country "for the health and happiness of a vast empire, the lives of whose teeming millions were far more intimately bound to their livestock and soil than the townspeople of this country had any conception of." (Page 90-91, Supplement to *The Veterinary Record.* July 31st, 1943.)

We have in this country about 45 million people whose declining birthrate indicates that these islands have reached saturation as far as human population is concerned, whilst our people are free to migrate within a vast empire the larger part of which is grossly underpopulated and underdeveloped. Some centripetal force appears to be holding our people to these islands when their duty to humanity demands that they should devote their energy and skill to promote the health and happiness of the great empire for which their forefathers assumed responsibility. In the conquest of the new problems which this task presents, I have little doubt a new vitality would be infused into our race which would overcome the problems of unemployment and declining birthrate.

I imagine that the failure of our race to face up to its empire responsibilities has been due to the fact that the empire is largely controlled by the British Parliament which has never really risen beyond the local problems of Britain, and has mainly looked on empire development from the viewpoint of British economy. Like the British Parliament the veterinary authorities in Britain have been almost entirely taken up with local problems and have failed to realise that, in the absence of an empire council, they are also largely responsible for the provision of veterinary services for overseas development.

The present war has shown the potential danger of an undeveloped empire and weak colonial communities, and politically and socially it will also give an impetus to emigration which will compel the Government to take steps to see that empire territories are given the assistance they require, not only in the interests of their native inhabitants, but also as an aid to British dispersion.

In the past, France and Germany have played a large part in the solving of tropical problems, but we must now take the place to which our unrivalled experience entitles us, and place our knowledge and our scientific ability at the disposal of the tropical world.

I would urge that the N.V.M.A. does its best to see that the veterinary profession is in a position to fulfil its function in colonial development, by pressing for the formation of a school of tropical veterinary medicine in Britain which still carries the biggest concentration of our people, and must therefore supply the majority of the tropical workers. Britain is also the only terrain where the varied races of the empire can meet in an atmosphere of social equality.

Yours faithfully,
U. F. Richardson.

110 Craiglea Drive,
Edinburgh.
August 15th, 1943.

DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
July 16th to 31st, 1943...	11	—	—	3	28
Corresponding period in—					
1942 ...	12	37	—	—	18
1941 ...	8	—	2	2	32
1940 ...	26	—	—	1	205
Total Jan. 1st to July 31, 1943	182	10	6	104	309
Corresponding period in—					
1942 ...	200	111	26	118	265
1941 ...	290	257	12	139	857
1940 ...	322	19	15	118	2,537

Note.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at July 31st, 1943, was as follows:—

England	Wales	Scotland	Total (Great Britain)
3,920	8,732	3,455	16,107